ELECTRONIC CODE OF FEDERAL REGULATIONS

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Title 40 \rightarrow Chapter I \rightarrow Subchapter C \rightarrow Part 98 \rightarrow Subpart A \rightarrow Appendix

Title 40: Protection of Environment
PART 98—MANDATORY GREENHOUSE GAS REPORTING
Subpart A—General Provision

TABLE A-1 TO SUBPART A OF PART 98—GLOBAL WARMING POTENTIALS

[100-Year Time Horizon]

Name	CAS No.	Chemical formula	Global warming potential (100 yr.)
С	hemical-Specific GWPs		
Carbon dioxide	124-38-9		1
Methane	74-82-8	CH ₄	^a 25
Nitrous oxide	10024-97-2	N ₂ O	^a 298
	ully Fluorinated GHGs		
Sulfur hexafluoride	2551-62-4	o .	^a 22,800
Trifluoromethyl sulphur pentafluoride	373-80-8		17,700
Nitrogen trifluoride	7783-54-2	0	17,200
PFC-14 (Perfluoromethane)	75-73-0	•	^a 7,390
PFC-116 (Perfluoroethane)	76-16-4	2F 2 6	^a 12,200
PFC-218 (Perfluoropropane)	76-19-7	C ₃ F ₈	^a 8,830
Perfluorocyclopropane	931-91-9	C-C ₃ F ₆	17,340
PFC-3-1-10 (Perfluorobutane)	355-25-9 C	C ₄ F ₁₀	^a 8,860
PFC-318 (Perfluorocyclobutane)	115-25-3 (C-C ₄ F ₈	^a 10,300
PFC-4-1-12 (Perfluoropentane)	678-26-2	C ₅ F ₁₂	^a 9,160
PFC-5-1-14 (Perfluorohexane, FC-72)	355-42-0		^a 9,300
PFC-6-1-12		C ₇ F ₁₆ ; CF ₃ (CF ₂) ₅ CF ₃	^b 7,820
PFC-7-1-18		C ₈ F ₁₈ ; CF ₃ (CF ₂) ₆ CF ₃	^b 7,620
PFC-9-1-18	306-94-5	C ₁₀ F ₁₈	7,500
PFPMIE (HT-70)		CF ₃ OCF(CF ₃)CF ₂ OCF ₂ OCF ₃	10,300
Perfluorodecalin (cis)	60433-11-6 Z	Z-C ₁₀ F ₁₈	^b 7,236
Perfluorodecalin (trans)	60433-12-7 E		^b 6,288
Saturated Hydrofluorocarbons	(HFCs) With Two or Fewer Carbon-Hy		1, 1, 11
HFC-23	75-46-7	CHF ₃	^a 14,800
HFC-32	75-10-5 C	CH ₂ F ₂	^a 675
HFC-125	354-33-6 C	C ₂ HF ₅	^a 3,500
HFC-134	359-35-3 C	C2H2F4	^a 1,100
HFC-134a	811-97-2		^a 1,430
HFC-227ca	2252-84-8 0	CF ₃ CF ₂ CHF ₂	^b 2640
HFC-227ea	431-89-0	C ₃ HF ₇	a3,220
HFC-236cb		CH ₂ FCF ₂ CF ₃	1,340
HFC-236ea		CHF ₂ CHFCF ₃	1,370
HFC-236fa	690-39-1		^a 9,810
HFC-329p		CHF ₂ CF ₂ CF ₂ CF ₃	^b 2360

593-53-3 430-66-0 420-46-2	C ₂ H ₃ F ₃	_
430-66-0 420-46-2 624-72-6 75-37-6 353-36-6	C ₂ H ₃ F ₃ C ₂ H ₃ F ₃	^a 353
420-46-2 624-72-6 75-37-6 353-36-6	C ₂ H ₃ F ₃	_
624-72-6 75-37-6 353-36-6		4,470
75-37-6 353-36-6	CH ₂ FCH ₂ F	_
353-36-6	OLL OLIE	53
	<u> </u>	^a 124
679-86-7	_ <u> </u>	12
		^a 693
	CF ₃ CF ₂ CH ₃	^b 4620
24270-66-4	CHF ₂ CHFCHF ₂	^b 235
431-31-2	CH ₂ FCHFCF ₃	^b 290
460-73-1	CHF ₂ CH ₂ CF ₃	1,030
421-07-8	CH ₃ CH ₂ CF ₃	^b 76
420-45-1	CH ₂ CF ₂ CH ₂	b144
1	1 0 2 0	794
1	1	
		14,900
		1,540
	<u> </u>	919
		^b 4,550
-		^b 6,490
		0,430
		6,320
1	1	^b 4,240
		2,800
		989
		487
	0 2 0	552
		380
	- "-	_
		1,500
		1,870
	1 = =	^b 583
	- · ·	350
		^b 3,825
173350-37-3	HF ₂ C-(OCF ₂ CF ₂) ₃ -OCF ₂ H	^b 3,670
249932-25-0	HF ₂ C-(OCF ₂) ₂ -OCF ₂ H	^b 5,300
249932-26-1	HF ₂ C-OCF ₂ CF ₂ OCF ₂ OCF ₂ O-CF ₂ H	^b 3,890
188690-77-9	HF ₂ C-(OCF ₂) ₃ -OCF ₂ H	^b 7,330
173350-38-4	HCF ₂ O(CF ₂ CF ₂ O) ₄ CF ₂ H	^b 3,630
84011-06-3	CHF ₂ CHFOCF ₃	^b 1,240
2261-01-0	CH ₂ FOCF ₃	^b 751
421-14-7	CH ₃ OCF ₃	756
22410-44-2	CH ₃ OCF ₂ CF ₃	708
84011-15-4	CHF ₂ CH ₂ OCF ₃	286
1885-48-9	CHF ₂ OCH ₂ CF ₃	659
	<u> </u>	359
-		11
	_ <u> </u>	b ₂₉
	0 2 0	575
		374
	431-31-2 460-73-1 421-07-8 420-45-1 406-58-6 (HCFEs) With 3822-68-2 2356-62-9 134769-21-4 428454-68-6 3330-15-2 Dn-Hydrogen 1691-17-4 32778-11-3 78522-47-1 57041-67-5 20193-67-3 156053-88-2 26103-08-2 188690-78-0 E1730133 13838-16-9 26675-46-7 205367-61-9 173350-37-3 249932-26-1 188690-77-9 173350-38-4 84011-06-3 2261-01-0 Carbon-Hydro 421-14-7 22410-44-2 84011-15-4 1885-48-9 425-88-7 460-43-5 690-22-2 375-03-1	431-31-2 CH ₂ FCHFCF ₃ 460-73-1 CH ₂ CH ₂ CF ₃ 421-07-8 CH ₃ CH ₂ CF ₃ 420-45-1 CH ₃ CF ₂ CH ₃ 406-58-6 CH ₃ CF ₂ CH ₂ CF ₃ 406-58-6 CH ₃ CF ₂ CH ₂ CF ₃ (HCFES) With One Carbon-Hydrogen Bond 3822-68-2 CHF ₂ OCF ₃ 2356-62-9 CF ₃ CHFOCF ₃ 134769-21-4 CF ₃ CF ₂ OCF ₂ CHF ₂ 428454-68-6 CF ₃ CFHCF ₂ OCF ₃ 3330-15-2 CF ₃ CF ₂ CF ₂ OCHFCF ₃ 32778-11-3 CHF ₂ OCF ₂ CHF ₂ 32778-11-3 CHF ₂ OCF ₂ CHF ₂ 57041-67-5 CHF ₂ OCHFCF ₃ 20193-67-3 CF ₃ CF ₂ OCH ₂ CF ₃ 26103-08-2 CHF ₂ OCH ₂ CF ₃ 26103-08-2 CHF ₂ OCH ₂ CF ₃ 26103-08-2 CHF ₂ OCH ₂ CF ₂ CHFC 13838-16-9 CHF ₂ OCF ₂ CHCC 26675-46-7 CHF ₂ OCF ₂ CHCCC 26675-46-7 CHF ₂ OCHCCF ₃ 205367-61-9 HF ₂ C-(OCF ₂ CF ₂) ₂ -OCF ₂ H 173350-37-3 HF ₂ C-(OCF ₂ CF ₂) ₂ -OCF ₂ H 173350-37-3 HF ₂ C-(OCF ₂ CF ₂) ₃ -OCF ₂ H 173350-38-4 HCF ₂ OCCF ₂ CF ₂ OCF ₂ OCF ₂ OCF ₂ CF ₂ H 173350-38-4 HCF ₂ OCCF ₂ CF ₂ OCF ₂ OCF ₂ DCF ₂ CF ₂ H 173350-38-3 CHF ₂ CHFOCF ₃ 2261-01-0 CH ₂ FOCF ₃ 2261-01-0 CH ₂ FOCF ₃ 22410-44-2 CH ₃ OCF ₂ CF ₃ 425-88-7 CH ₃ OCF ₂ CF ₂ CF ₂ CF ₃ 375-03-1 CH ₃ OCF ₂ CF ₂ CF ₂ CF ₂ CF ₂ CF ₃ 171182-95-9 CF ₃ CF ₂ OCH ₂ CHF ₂

HFE-347mmy1	22052-84-2 CH ₃ OCF(CF ₃) ₂	343
HFE-347mmz1 (Sevoflurane)	28523-86-6 (CF ₃) ₂ CHOCH ₂ F	^c 216
HFE-347pcf2	406-78-0 CHF ₂ CF ₂ OCH ₂ CF ₃	580
HFE-356mec3	382-34-3 CH ₃ OCF ₂ CHFCF ₃	101
HFE-356mff2	333-36-8 CF ₃ CH ₂ OCH ₂ CF ₃	b17
HFE-356mmz1	13171-18-1 (CF ₃) ₂ CHOCH ₃	27
HFE-356pcc3	160620-20-2 CH ₃ OCF ₂ CF ₂ CHF ₂	110
HFE-356pcf2	50807-77-7 CHF, CH, OCF, CHF,	265
HFE-356pcf3	35042-99-0 CHF ₂ OCH ₂ CF ₂ CHF ₂	502
HFE-365mcf2	22052-81-9 CF ₃ CF ₂ OCH ₂ CH ₃	^b 58
HFE-365mcf3	378-16-5 CF ₃ CF ₂ CH ₂ OCH ₃	11
HFE-374pc2	512-51-6 CH ₃ CH ₂ OCF ₂ CHF ₂	557
HFE-449s1 (HFE-7100) Chemical blend	163702-07-6 C ₄ F ₉ OCH ₃	297
	163702-08-7 (CF ₃) ₂ CFCF ₂ OCH ₃	
HFE-569sf2 (HFE-7200) Chemical blend	163702-05-4 C ₄ F ₉ OC ₂ H ₅	59
	163702-06-5 (CF ₃) ₂ CFCF ₂ OC ₂ H ₅	
HG'-01	73287-23-7 CH ₃ OCF ₂ CF ₂ OCH ₃	b ₂₂₂
HG'-02	485399-46-0 CH ₃ O(CF ₂ CF ₂ O) ₂ CH ₃	b ₂₃₆
HG'-03	485399-48-2 CH ₃ O(CF ₂ CF ₂ O) ₃ CH ₃	b ₂₂₁
Difluoro(methoxy)methane	359-15-9 CH ₃ OCHF ₂	b ₁₄₄
2-Chloro-1,1,2-trifluoro-1-methoxyethane	425-87-6 CH ₃ OCF ₂ CHFCl	
1-Ethoxy-1,1,2,2,3,3,3-heptafluoropropane	v -	b122
2-Ethoxy-3,3,4,4,5-pentafluorotetrahydro-2,5-bis[1,2,2,2-tetrafluoro-	22052-86-4 CF ₃ CF ₂ CF ₂ OCH ₂ CH ₃	^b 61
1-(trifluoromethyl)ethyl]-furan	920979-28-8 C ₁₂ H ₅ F ₁₉ O ₂	^b 56
1-Ethoxy-1,1,2,3,3,3-hexafluoropropane	380-34-7 CF ₃ CHFCF ₂ OCH ₂ CH ₃	^b 23
Fluoro(methoxy)methane	460-22-0 CH ₃ OCH ₂ F	^b 13
1,1,2,2-Tetrafluoro-3-methoxy-propane; Methyl 2,2,3,3-tetrafluoropropyl ether	60598-17-6 CHF ₂ CF ₂ CH ₂ OCH ₃	^b 0.5
1,1,2,2-Tetrafluoro-1-(fluoromethoxy)ethane	37031-31-5 CH ₂ FOCF ₂ CF ₂ H	^b 871
Difluoro(fluoromethoxy)methane	461-63-2 CH ₂ FOCHF ₂	^b 617
Fluoro(fluoromethoxy)methane	462-51-1 CH ₂ FOCH ₂ F	^b 130
Fluorinated For		
Trifluoromethyl formate	85358-65-2 HCOOCF ₃	^b 588
Perfluoroethyl formate	313064-40-3 HCOOCF ₂ CF ₃	^b 580
1,2,2,2-Tetrafluoroethyl formate	481631-19-0 HCOOCHFCF ₃	^b 470
Perfluorobutyl formate	197218-56-7 HCOOCF ₂ CF ₂ CF ₂ CF ₃	^b 392
Perfluoropropyl formate	271257-42-2 HCOOCF ₂ CF ₂ CF ₃	^b 376
1,1,1,3,3,3-Hexafluoropropan-2-yl formate	856766-70-6 HCOOCH(CF ₃) ₂	^b 333
2,2,2-Trifluoroethyl formate	32042-38-9 HCOOCH ₂ CF ₃	b33
3,3,3-Trifluoropropyl formate	1344118-09-7 HCOOCH ₂ CH ₂ CF ₃	^b 17
Fluorinated Ace Methyl 2,2,2-trifluoroacetate	431-47-0 CF ₃ COOCH ₃	h
1,1-Difluoroethyl 2,2,2-trifluoroacetate	<u> </u>	b52
Difluoromethyl 2,2,2-trifluoroacetate	1344118-13-3 CF ₃ COOCF ₂ CH ₃ 2024-86-4 CF ₃ COOCHF ₂	^b 31
2,2,2-Trifluoroathyl 2,2,2-trifluoroacetate	<u> </u>	
Methyl 2,2-difluoroacetate	407-38-5 CF ₃ COOCH ₂ CF ₃	b7
Perfluoroethyl acetate	433-53-4 HCF ₂ COOCH ₃	b ₃
r cinuulocuiyi acetate	343269-97-6 CH ₃ COOCF ₂ CF ₃ 74123-20-9 CH ₃ COOCF ₃	^b 2.1
Trifluoromethyl acetate	14120-20-8000000Fg	^b 2.0
Trifluoromethyl acetate		
Perfluoropropyl acetate	1344118-10-0 CH ₃ COOCF ₂ CF ₂ CF ₃	
Perfluoropropyl acetate Perfluorobutyl acetate	1344118-10-0 CH ₃ COOCF ₂ CF ₂ CF ₃ 209597-28-4 CH ₃ COOCF ₂ CF ₂ CF ₂ CF ₃	^b 1.6
Perfluoropropyl acetate Perfluorobutyl acetate Ethyl 2,2,2-trifluoroacetate	1344118-10-0 CH ₃ COOCF ₂ CF ₂ CF ₃ 209597-28-4 CH ₃ COOCF ₂ CF ₂ CF ₂ CF ₃ 383-63-1 CF ₃ COOCH ₂ CH ₃	b1.8 b1.6 b1.3
Perfluoropropyl acetate Perfluorobutyl acetate	1344118-10-0 CH ₃ COOCF ₂ CF ₂ CF ₃ 209597-28-4 CH ₃ COOCF ₂ CF ₂ CF ₂ CF ₃ 383-63-1 CF ₃ COOCH ₂ CH ₃	^b 1.6

Fluorinated Alcohols Other Than Fluore	otelomer Alcoh	ols	
Bis(trifluoromethyl)-methanol	920-66-1	(CF ₃) ₂ CHOH	195
(Octafluorotetramethy-lene) hydroxymethyl group	NA	X-(CF ₂) ₄ CH(OH)-X	73
2,2,3,3,3-Pentafluoropropanol	422-05-9	CF ₃ CF ₂ CH ₂ OH	42
2,2,3,3,4,4,4-Heptafluorobutan-1-ol		C ₃ F ₇ CH2OH	^b 25
2,2,2-Trifluoroethanol		CF ₃ CH ₂ OH	^b 20
2,2,3,4,4,4-Hexafluoro-1-butanol		CF ₃ CHFCF ₂ CH ₂ OH	b ₁₇
2,2,3,3-Tetrafluoro-1-propanol		CHF,CF,CH,OH	b ₁₃
2,2-Difluoroethanol		CHF ₃ CH2OH	b3
2-Fluoroethanol		CH ₂ FCH ₂ OH	b _{1.1}
4.4.4-Trifluorobutan-1-ol		CF ₃ (CH ₂) ₂ CH ₂ OH	b _{0.05}
Unsaturated Perfluorocarbon		3, 2,5 5	
PFC-1114; TFE		$CF_2 = CF_2$; C_2F_4	^b 0.004
PFC-1216; Dyneon HFP		C_3F_6 ; $CF_3CF = CF_2$	^b 0.05
PFC C-1418	559-40-0		b _{1.97}
Perfluorobut-2-ene		CF ₃ CF = CFCF ₃	b _{1.82}
Perfluorobut-1-ene		$CF_3CF_2CF = CF_2$	b _{0.10}
Perfluorobuta-1,3-diene		CF ₂ = CFCF = CF ₂	b _{0.003}
Unsaturated Hydrofluorocarbons (HFCs) and Hydro		-	0.003
HFC-1132a; VF2		C ₂ H ₂ F ₂ , CF ₂ = CH ₂	^b 0.04
HFC-1141; VF		C ₂ H ₃ F, CH ₂ = CHF	^b 0.02
(E)-HFC-1225ye		CF ₃ CF = CHF(E)	b _{0.02}
(Z)-HFC-1225ye		CF ₃ CF = CHF(Z)	b _{0.22}
Solstice 1233zd(E)		C ₃ H ₂ CIF ₃ ; CHCI = CHCF ₃	
HFC-1234yf; HFO-1234yf			b1.34
HFC-1234ze(E)		$C_3H_2F_4$; $CF_3CF = CH_2$ $C_3H_2F_4$; trans- $CF_3CH = CHF$	^b 0.31
			^b 0.97
HFC-1234ze(Z)	29118-25-0	$C_3H_2F_4$; cis- $CF_3CH = CHF$; $CF_3CH = CHF$	^b 0.29
HFC-1243zf; TFP	677-21-4	$C_3H_3F_3$, $CF_3CH = CH_2$	^b 0.12
(Z)-HFC-1336	692-49-9	$CF_3CH = CHCF_3(Z)$	^b 1.58
HFC-1345zfc	374-27-6	C ₂ F ₅ CH = CH ₂	^b 0.09
Capstone 42-U	19430-93-4	$C_6 H_3 F_9$, $CF_3 (CF_2)_3 CH = CH_2$	^b 0.16
Capstone 62-U	25291-17-2	C ₈ H ₃ F ₁₃ , CF ₃ (CF ₂) ₅ CH = CH ₂	^b 0.11
Capstone 82-U	21652-58-4	$C_{10}H_{3}F_{17}, CF_{3}(CF_{2})_{7}CH = CH_{2}$	^b 0.09
Unsaturated Halogenated E	thers		
PMVE; HFE-216	1187-93-5	CF ₃ OCF = CF ₂	^b 0.17
Fluoroxene	406-90-6	CF ₃ CH ₂ OCH = CH ₂	^b 0.05
Fluorinated Aldehyde			
3,3,3-Trifluoro-propanal	460-40-2	CF ₃ CH ₂ CHO	^b 0.01
Fluorinated Ketones			
Novec 1230 (perfluoro (2-methyl-3-pentanone))		CF ₃ CF ₂ C(O)CF (CF3) ₂	^b 0.1
Fluorotelomer Alcohol		los (os y ou ou ou	
3,3,4,4,5,5,6,6,7,7,7-Undecafluoroheptan-1-ol		CF ₃ (CF ₂) ₄ CH ₂ CH ₂ OH	^b 0.43
3,3,3-Trifluoropropan-1-ol		CF ₃ CH ₂ CH ₂ OH	^b 0.35
3,3,4,4,5,5,6,6,7,7,8,8,9,9,9-Pentadecafluorononan-1-ol		CF ₃ (CF ₂) ₆ CH ₂ CH ₂ OH	^b 0.33
3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,11-Nonadecafluoroundecan-1-ol		CF ₃ (CF ₂) ₈ CH ₂ CH ₂ OH	^b 0.19
Fluorinated GHGs With Carbon-lo		lor i	
Trifluoroiodomethane Other Fluorinated Common	2314-97-8	UF ₃	^b 0.4
Other Fluorinated Compos Dibromodifluoromethane (Halon 1202)		CBR ₂ F ₂	book
2-Bromo-2-chloro-1,1,1-trifluoroethane (Halon-2311/Halothane)		CHBrCICF ₃	^b 231
<u></u>	101-07-7	3	^b 41
Fluorinated GHG Group ^d			Global warming potential (100 yr.)

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Fully fluorinated GHGs	10,000
Saturated hydrofluorocarbons (HFCs) with 2 or fewer carbon-hydrogen bonds	3,700
Saturated HFCs with 3 or more carbon-hydrogen bonds	930
Saturated hydrofluoroethers (HFEs) and hydrochlorofluoroethers (HCFEs) with 1 carbon-hydrogen bond	5,700
Saturated HFEs and HCFEs with 2 carbon-hydrogen bonds	2,600
Saturated HFEs and HCFEs with 3 or more carbon-hydrogen bonds	270
Fluorinated formates	350
Fluorinated acetates, carbonofluoridates, and fluorinated alcohols other than fluorotelomer alcohols	30
Unsaturated perfluorocarbons (PFCs), unsaturated HFCs, unsaturated hydrochlorofluorocarbons (HCFCs), unsaturated halogenated ethers, unsaturated halogenated esters, fluorinated aldehydes, and fluorinated ketones	1
Fluorotelomer alcohols	1
Fluorinated GHGs with carbon-iodine bond(s)	1
Other fluorinated GHGs	2,000

^aThe GWP for this compound was updated in the final rule published on November 29, 2013 [78 FR 71904] and effective on January 1, 2014.

^bThis compound was added to Table A-1 in the final rule published on December 11, 2014, and effective on January 1, 2015.

 $^{\rm c}$ The GWP for this compound was updated in the final rule published on December 11, 2014, and effective on January 1, 2015 .

^dFor electronics manufacturing (as defined in §98.90), the term "fluorinated GHGs" in the definition of each fluorinated GHG group in §98.6 shall include fluorinated heat transfer fluids (as defined in §98.98), whether or not they are also fluorinated GHGs.

[79 FR 73779, Dec. 11, 2014]	

Need assistance?